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STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
7272 Cleanwater Lane, Olympia, Washington 98504

MEMORANDUM
June 4, 1980

To: Frank Monahan

From: Bill Yake B.Y.

Subject: Hooker Chemical Corp., Tacoma, Class II Inspection

Introduction

On September 25-26, 1979 a Class II compliance monitoring inspection was conducted at Hooker Chemical Corporation. Participating were Frank Monahan (DOE, S.W. Regional Office), Bill Yake and Eric Egbers (DOE, Ambient and Compliance Monitoring). Representing Hooker Chemical were Lyle Feller (Assistant Production Manager), Don Beardsly (Work's Chemist), and Bob Johnston (Senior Laboratory Technician).

The Hooker/Tacoma complex consists of a chlor/alkali plant, an ammonia plant, and a muriatic acid plant. Wastewaters from all operations are discharged from a common diffuser to the Hylebos Waterway. Wastewater treatment consists of pH adjustment and standby capability for reducing chlorine residual by SO_2 injection.

One of the primary purposes for this sampling inspection was to attempt to characterize the "priority pollutants" (primarily chlorinated organics) in the wastewater. The primary source of chlorinated organics is believed to be the chlorine plant's carbon anode which is impregnated with linseed oil. The discharge from this operation enters the general wastewater stream from the chlorine "stripper". Grab samples of this stripper effluent were collected for GC/MS analysis by USEPA laboratories in Manchester. Composite samples, as well as grab samples, for volatile organics analysis were collected at the plant's influent (saltwater) sampling site and total effluent sampling site. Organic analyses were conducted at EPA Manchester Labs. Conventional analyses were performed at DOE water laboratories in Tumwater. Samples were split (or, when necessary, duplicate samples taken) with Hooker representatives. Samples were analyzed for conventional pollutants and metals by Hooker's Tacoma labs. Organic and metals analyses were conducted for Hooker by Can-Test.

Hooker effluents discharge to the Hylebos Waterway (segment No. 05-10-01). This segment (Inner Commencement Bay) is identified in the 5-year Strategy as a segment which does not meet state and federal water quality goals (fecal coliform and dissolved oxygen) and it is unknown whether BPT or secondary treatment will result in attainment of these goals. Hooker effluent probably has little impact on the ability of the receiving

water to meet goals for conventional pollutants (with the possible excep tion of pH). However, the impacts of priority pollutants (primarily chlorinated hydrocarbons) and residual chlorine are unknown at this time.

Findings and Conclusions

The results of sample analyses for conventional pollutants and metals are given in Tables 1, 2, and 3.

All analyses indicated Hooker was meeting permit limitations for ammonia. Field analyses indicated compliance with temperature, pH, and total chlorine residual limitations. Results from suspended solids analyses are ambiguous. The DOE effluent composite had much higher (10 to 10.6 mg/l) suspended solids concentrations than Hooker's sample (<1 to 5 mg/l). A reddish floc was noted in the DOE sample. An aliquot of this sample was filtered and the suspended solids analyzed for iron. The analysis revealed 2.2 mg/l suspended iron which compares well with Can-Test total iron results (1.85 mg/l) for the same sample.

Metals analyses from DOE laboratories provided no useful data as the extraction required for saltwater samples was not performed. Can-Test results indicate significant net discharges of three metals: iron; nickel; and chromium. The approximate net effluent loadings for iron (230 lbs/day) and nickel (30 lbs/day [based on Can-Test results]) are in excess of levels existing at the time of application (Table 3). The approximate chromium loading was 16 lbs/day. Data provided at the time of application showed no net effluent chromium loading. The Can-Test results appear to be the most accurate available for the effluent metals loadings at the time of sampling for two reasons: (1) Samples were taken from DOE's samplers which were acid rinsed prior to sampling; and (2) the influent and effluent loadings for many of the species analyzed (mentioned above) were very close.

Recommended marine criteria[1] for the protection of fish and shellfish are compared to the saltwater influent and plant effluent concentrations in Table 4.

Table 4. Trace Metal Concentrations

Metal	Saltwater Intake (Hylebos Waterway) µg/l (total)	Hooker Effluent µg/l (total)	Criteria Level Marine µg/l	Criteria Level Freshwater µg/l
Iron	94	1,850	*	1,000
Nickel	<30	250	(100)	100
Chromium	6	130	(100)	100

*Inadequate data.

[1] USEPA, 1976. Quality Criteria for Water.

It appears that the concentrations of metals in Hooker's effluent are not high enough to result in concentrations above criteria levels outside the dilution zone.

Priority (Toxic Organics) Pollutant Results

Priority pollutants samples were obtained at three locations at the Hooker facility (see Table 5).

Table 5. Priority Pollutant Sampling

Location	Sample Type	Date/Time	Analysis
Saltwater Influent	Composite (24 hr)	9/25/79 - 1150	Base/Neutral Fraction
	Grab	9/25/79 - 1210	Volatile Organic
Stripper Effluent	Grab	9/25/79 - 1400	Base/Neutral Fraction
	Grab	9/25/79 - 1400	Volatile Organic
Total Effluent	Composite (24 hr)	9/25/79 - 1100	Base/Neutral Fraction
	Grab	9/25/79 - 1120	Volatile Organic

Composite samples were split with Hooker personnel for subsequent analysis by Can-Test. Duplicate volatile organics samples were taken for the same purpose. All sampling was performed in accordance with USEPA guidance including obtaining distilled water VOA (volatile organic analysis) blanks and B/N (base/neutral) blanks.

Analyses of VOA and B/N samples were performed by the Region X USEPA (Manchester) Laboratory. Frank Monahan requested that the Manchester Laboratory provide us with written information on their analytical procedures. As of this date, that information has not been received. However, lab personnel have discussed their procedures with us. It is my understanding that 3 to 3.5 liters of sample was extracted for the base/neutral sample. Forty (40) ml of VOA sample was analyzed using a Teckmar Purge and Trap Apparatus. Base/neutral samples were analyzed using the GS/MS.

EPA test results were transmitted to us, and this transmittal is attached. Split sample results from Can Test were transmitted in a report entitled "Environmental Protection Agency Priority Pollutant Analysis of DOE Samples for Hooker Chemicals and Plastics Corporation, Tacoma, Washington." An additional series of samples was analyzed by Can-Test for Hooker. For this effort, samples were obtained on different days of four successive weeks. B/N samples were 24-hour grab composites, while VOA samples were grabs. The results of these tests were transmitted in a document entitled "Environmental Protection Agency Priority Pollutant Analyses of Influent and Effluent Samples for Hooker Chemicals and Plastics Corporation, Tacoma, Washington."

The results of these analyses are summarized in Table 6. Results are tabulated only for those constituents which were detected in significant concentrations. Table 7 lists the organics which appear to (at least during one or more of the sampling efforts) increase in concentration through Hooker's facilities. These values are compared to EPA's water quality criteria. Note that the criteria levels are based on receiving water concentrations while the analytical results presented here are effluent values.

In addition to the identified compounds, the EPA analyses also detected the presence of significant concentrations of "unidentified characteristic chlorinated organic compounds" in the stripper and total effluent which were not detected in the saltwater influent. Although identification of these compounds is a prerequisite for determining their concentrations in the effluent, it is clear that they are present in higher concentrations than the compounds identified in Table 7.

In comparing the effluent concentrations to the water quality criteria in Table 7, it is important to note that effluent from the Hooker outfall would be substantially diluted in Hylebos Waterway. Even discounting the effect of this dilution, the concentrations reported in Table 7 are all below the criteria levels for the protection of marine life.

The comparison to carcinogenic risk levels is less clear-cut. It is likely that dilution would bring receiving water concentrations below the specified levels except possibly in the case of hexachlorobenzene.

Review of Laboratory Procedures and Techniques

Sample collection and suspended solids analyses were reviewed with the laboratory personnel at Hooker. In general, the techniques employed were quite satisfactory.

BY:cp

Attachments

Class II Field Review and Sample Collection

24-hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Saltwater influent	9/25/79 - 1150	Pressure tap near Hooker composite location
sample aliquot: 262 ml/30 min.		
2. Ammonia plant effluent	9/25/79 - 1315	Ammonia plant sewer, through manhole near Hooker sampling point
sample aliquot:		
3. Total effluent	9/25/79 - 1100	Mixing box, same as Hooker
sample aliquot: 280 ml/20 min.		
4.		
sample aliquot:		
5.		
sample aliquot:		

Field Data

Parameter(s)	Date and Time	Sample Location
pH, Temp., TCR	9/25/79 - 1105	Total effluent
pH, Temp., TCR	9/26/79 - 1040	Total effluent
pH, Temp.	9/25/79 - 1200	Saltwater influent
pH, Temp.	9/26/79 - 1140	Saltwater influent
pH, Cond., Temp.	9/25/79 - 1320	Ammonia sewer
pH, Cond., Temp.	9/26/79 - 1230	Ammonia sewer

Grab Samples

Lab Analysis	Date and Time	Sample Location
Volatile organics	9/25/79 - 1120	Total effluent
Volatile Organics	9/25/79 - 1210	Saltwater influent
Volatile organics	9/25/79 - 1400	Chlorine stripper effluent
Base/neutral organics fraction	9/25/79 - 1400	Chlorine stripper effluent

Table 1. DOE Field and Laboratory Results

Parameter	DOE Composite Samplers					Hooker Composite Samplers					NPDES Permit Limits Daily Average
	Saltwater Plant Influent	City Water Plant Influent	Ammonia Sewer	Total Effluent	Net Discharge	Saltwater Plant Influent	City Water Plant Influent	Ammonia Sewer	Total Effluent	Net Discharge	
Flow (MGD)	(12.096)	(3.694)	(0.39)	(15.49)		12.096	3.694	0.39	15.49		17.726
TSS (mg/l)	4	(<1)	3	10		5	<1	2	<1		
(lbs/day)	400	(<30)	9.8	1,300	870 to 900	500	<30	6.5	<130	-370 to -530	272*
NH_3-N (mg/l)	.03	--	.17	.02		.04	--	.12	--		
(lbs/day)	3.03	--	0.55	2.58	-0.45	4.04	--	0.39	--	--	12.5*
Pb (mg/l)	?	--	--	?		?	.12	--	--		
(lbs/day)					?	?	3.7	--	--	--	2.1*
Total Chlorine Residual (mg/l)				0.4† 0.5†							1.0
Temp (°C)	14.2† 14.6†	-- --	31.0† 30.8	28.1† 24.4		-- --	-- --	-- --	-- --		94°F (34.4°C)
pH	7.8 8.0† 8.0† 8.0††	--	8.0 7.5† 7.7† 7.8††	7.9 7.3† 7.7† 7.5††		7.7	--	--	7.8		6 - 9
Total Solids (mg/l)	38,000	-	80	26,000		35,000	68	75	26,000		
TNVS (mg/l)	28,000	--	44	22,000		28,000	46	44	22,000		
TSS (mg/l)	4	--	3	10		5	<1	2	<1		
TNVSS (mg/l)	2	00	1	6		4	<1	<1	<1		
NH_3-N (mg/l)	.03	--	.17	.02		04	--	.12	--		
NO_2-N (mg/l)	<.01	--	<.01	<.01		<.01	--	<.01	--		
NO_3-N (mg/l)	.16	--	1.7	.16		.15	--	1.1	--		
Turbidity (JTU)	3	--	--	--		9	--	2	--		
Spec. Cond. (μmhos/cm)	42,800	--	109 131† 92† 108††	32,300		33,000	--	160	--		
Copper (mg/l)	?	--	--	?		?	.03	--	--	--	
lbs/day					?		0.92	--	--	--	(2.0)[1]*
Zinc (mg/l)	?	--	--	?		?	.04	--	--	--	
lbs/day					?		1.2	--	--	--	(100)[1]*
Iron (mg/l)	?	--	--	?		?	.06	--	--	--	
lbs/day					?		1.8	--	--	--	(24)[1]*
Nickel (mg/l)	?	--	--	?		?	.10	--	--	--	
lbs/day					?		3.1	--	--	--	(-)[1]*
Lead (mg/l)	?	--	--	?		?	.12	--	--	--	
lbs/day					?		3.7	--	--	--	2.1*

1) NPDES Permit: "Other parameters may be discharged at levels existing at time of application." These values were determined during pre-permit process.
† Grab - field analysis
†† Composite - field analysis
* Net loading (discharge-influent)
? Error, no extraction on saltwater samples, see Table 6 - Can-Test results
< is "less than"

Table 2. Hooker Laboratory Results

	DOE Composite Samplers					Hooker Composite Samplers					
Parameter	Saltwater Plant Influent	City Water Plant Influent	Ammonia Sewer	Total Effluent	Net Discharge	Saltwater Plant Influent	City Water Plant Influent	Ammonia Sewer	Total Effluent	Net Discharge	NPDES Permit Limits Daily Average
Flow (MGD)	12.20	3.60	.39	15.50	--	12.20	3.60	.39	15.50	--	17.726
TSS (mg/l)	8.2	--	--	10.6	--	6.6	--	--	4.9	--	
lbs/day	830	--	--	1370	540	670	--	--	630	-40	272*
NH_3-N (mg/l)	--	--	.40	.02	--	--	--	.48	.06	--	
lbs/day	--	--	1.3	2.6	<2.6	--	--	1.6	7.8	<7.8	12.5*
Pb (mg/l)	--	--	.003	.003	--	N.D.	N.D.	.003	.003	--	
lbs/day	--	--	.01	.39	<.39	<.21	<.03	.01	.39	.15-.39	2.10*
Total Chl. Resid. (mg/l)				.05					.04		1.0
Copper (mg/l)	.004	(.03)	.027	.005		.003	.03	.027	.003		
lbs/day	.41	(.90)	.08	.65	-.66	.31	.90	.08	.39	-.82	(2.0)[1]*
Zinc (mg/l)	.02	(.01)	.02	.02		.02	.01	.02	.02		
lbs/day	2.03	(.3)	.06	2.58	.25	2.04	.3	.06	2.58	.24	(100)[1]*
Iron (mg/l)	.18	(.14)	.16	.22		.16	.14	.16	.14		
lbs/day	18.36	(4.2)	.48	22.38	-.18	16.32	4.2	.48	18.06	-2.5	(24)[1]*
Nickel (mg/l)	.05	(N.D.)	.02	.33		.007	N.D.	.02	.03		
lbs/day	5.10	<.09	.06	42.57	37.5	.71	<.09	.06	3.87	3.1-3.2	(-)[1]*
Lead (mg/l)	--	N.D.	.003	.003		N.D.	N.D.	.003	.003	--	
lbs/day	--	<.03	.01	.39	<.39	<.21	<.03	.01	.39	.15-.39	2.10*

1) NPDES Permit: "Other parameters may be discharged at levels existing at time of application"
* Net loading (discharge-influent)
"<" = "less than"

Table 3. Can-Test Laboratory Results (Metals)

Element	Saltwater Influent mg/l	lbs/day	Total Effluent mg/l	lbs/day	Approximate Net lbs/day
Copper	.042	4.27	.005	0.65	-3.6
Zinc	.046	4.68	.016	2.07	-2.6
Iron	.094	9.56	1.85	239	229
Nickel	<.03	<3.05	.25	32.3	29 to 32
Lead	.008	0.81	.002	.23	-.5
Aluminum	N.D.	--	N.D.	--	--
Antimony	<.05	--	<.05	--	--
Arsenic	<.03	--	<.03	--	--
Barium	.006	.61	.005	.65	In
Beryllium	N.D.	--	N.D.	--	--
Bismuth	N.D.	--	N.D.	--	--
Boron	3.06	311	2.35	304	In
Cadmium	N.D.	--	N.D.	--	--
Calcium	284	28,900	220	28,400	In
Chromium	.006	.61	.13	16.8	16
Cobalt	N.D.	--	N.D.	--	--
Magnesium	1010	103,000	787	102,000	In
Manganese	.007	.71	.039	5.04	4.3
Mercury	N.D.	--	N.D.	--	--
Molybdenum	N.D.	--	N.D.	--	--
Potassium	359	36,500	280	36,200	In
Selenium	N.D.	--	N.D.	--	--
Silver	N.D.	--	N.D.	--	--
Sodium	9290	945,000	6800	879,000	In
Strontium	5.94	604	4.62	597	In
Tin	N.D.	--	N.D.	--	--
Titanium	N.D.	--	N.D.	--	--
Tungsten	N.D.	--	N.D.	--	--
Thallium	N.D.	--	N.D.	--	--
Vanadium	N.D.	--	N.D.	--	--

In = Insignificant

N.D. = No data

Table 6. Summary of Priority (organic) Pollutants Detected in Hooker Wastewater Stream

A. USEPA Results - Samples obtained during Class II Inspection

Parameter*	Location				
	Influent (µg/l)	Stripper Effluent (µg/l)	Total Effluent (µg/l)	Blank (µg/l)	
Volatile Organics					
Chloroform	1	28	11	N.D.	N.D.
Bromoform	N.D.	3	9	N.D.	2
Dibromochloromethane	N.D.	17	1	N.D.	N.D.
Tetrachloroethylene	0.3	30	4	N.D.	N.D.
Methylene chloride	N.D.	13	N.D.	1	2
Base/Neutral Extraction					
Hexachlorobenzene	N.D.	30	0.3	N.D.	
Hexachlorobutadiene	N.D.	9	0.2	N.D.	

* "unidentified chlorinated organic compounds" were also detected, primarily in stripper effluent and total effluent.
N.D. = None detected.

B. Hooker Can-Test Results - Samples obtained during Class II Inspection

No organics detected in samples

C. Hooker/Can-Test Results - Samples obtained in subsequent 4-week test

Parameter	Influent (µg/l) Week				Total Effluent (µg/l) Week				Detection Limit (µg/l)
	1	2	3	4	1	2	3	4	
Volatile Organics									
Carbontetrachloride	N.D.	20	50	N.D.	N.D.	30	N.D.	N.D.	10
Chloroform	N.D.	N.D.	N.D.	N.D.	10	20	N.D.	20	10
Bromoform	N.D.	N.D.	N.D.	N.D.	30	90	50	100	10
Methylene chloride	20	10	110	50	10	10	N.D.	N.D.	10
Dibromochloromethane	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	10	10

Table 7. Organic Pollutants Apparently Generated by Hooker Facilities

Parameter	Stripper Effluent (µg/l)	Net Concentration Increase in Final Effluent (µg/l)	Receiving Water Criteria	
			Marine Life (24-hr Ave.) (µg/l)	Carcinogenic Risk Level* (µg/l)
Bromoform	3	9 to 100	180	--
Chloroform	28	<10 to 20	2,000	18
Tetrachloroethylene	30	4	79	4
Dibromochloromethane	17	1 to 10	--	--
Hexachlorobenzene	30	0.3	--	.0012
Hexachlorobutadiene	9	0.2	--	.87
Carbontetrachloride	--	+10 to -50	2,000	6.7

*This is the concentration at which EPA[1] calculates "a probability of one additional case of cancer for every 100,000 people exposed", based on the consumption of fish and shellfish from water with these concentrations.

[1] USEPA; *Chlorinated Benzenes, Ambient Water Quality Criteria;* Criteria and Standards Division, EPA. 171 pp.

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTO[illegible] 98101

January 30, 19[illegible]

REPLY TO
ATTN OF:

EPA Region 10 Laboratory
P. O. Box 549
Manchester, WA 98353

Mr. William Yake
Washington State Dept. of Ecology
Olympia, Washington

Dear Bill:

Enclosed is Joe Blazevich's report on the samples you submitted for analysis from the Hooker Chemical Company in Tacoma.

You may wish to confer with Joe before you issue your final report. Our telephone number is 442-0370 (Seattle).

It is suggested if agreeable to DOE personnel that enventually a meeting should be held between DOE and Hooker personnel to discuss the "unknown" compounds.

Sincerely yours,

Arnold Gahler

Arnold R. Gahler
Chief, Laboratory Branch

ARG:bh

Enclosure

cc: G. O'Neal
K. Mosbaugh

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: January 28, 1980

BJECT: Hooker Chemical Samples

FROM: J. N. Blazevich JNB

TO: Arnold Gahler

The State of Washington department of Ecology made a request of our laboratory to analyze influent and effluent samples from Hooker Chemical Company in Tacoma for those chemicals found on the priority pollutant list. We have completed the analysis of all samples for volatile organics, base-neutrals and acid compounds.

Examination of the results, found in the attached table, allows one to state the following.

(1) Some chlorinated organic compounds on the priority pollutant list are present in the stripper effluent (39004) and the effluent samples (39000 and 39001) but not the salt water influent samples (39002 and 29003).

(2) Perhaps of greater interest is the number and apparently larger concentration of unidentified chlorinated compounds detected in the stripper and composite effluent samples but not the composite salt water influent samples.

One need only to compare the total ion current profiles and extracted ion current profiles (M^+/e = 177, 179, 181) (figures 1-3) obtained from the analysis of base-neutral fractions of the stripper and composite effluent samples along with the observed spectra of selected peaks (figures 4-9) to conclude that at least three unidentified chlorinated compounds are found in large concentration in each sample. Analysis of the stripper effluent on a newly acquired glass capillary system shows these three peaks are multicomponent peaks. A like analysis of composite saltwater influent data indicates none of these compounds are found in that sample.

So far work to identify the more concentrated unknown chlorinated compounds has been unsuccessful. A concerted effort may be necessary to elucidate the structures of these compounds.

Summary-Priority Pollutants
Found in Hooker Chemical
Samples

(Results expressed in 10^{-6} g/l)

Acid Fraction	Effluent Composite (A) 39000	Effluent Grab 39001	Influent Composite (A) 39002	Influent Grab 39003	Stripper Effluent 39004	VOA Blanks 39005	VOA Blanks 39006	B-N/Acid Blank
phenol	0.1	0.05	N.F.(B)	0.2	N.F.	-	-	N.F.
Neutral/Base Fraction								
hexachlorobenzene	0.3	N.F.	N.F.	N.F.	30	-	-	N.F.
hexachlorobutadiene	0.2	N.F.	N.F.	N.F.	9	-	-	N.F.
bis(2-ethylhexyl)phthalate	0.4	0.5	0.5	0.8	N.F.	-	-	0.1
di-n-butyl phthalate	0.5	0.5	0.4	2	N.F.		-	0.1
di-n-octyl phthalate	N.F.	N.F.	N.F.	N.F.	9	-	-	N.F
unidentified characteristic chlorinated organic compounds	present	N.F.	N.F.	N.F.	present	-	-	N.F.
Volatile Organic Fraction								
chloroform	-	11	-	1	28	0.1	N.F.	
bromoform	-	9	-	N.F.	3	N.F.	2	
dibromochloromethane	-	1	-	N.F.	17	N.F.	N.F.	
tetrachloroethylene	-	4	-	0.3	30	N.F.	N.F.	
trichloroethylene	-	1	-	1	N.F.	N.F.	N.F.	
bromodichloromethane	-	N.F	-	N.F.	30	N.F.	N.F.	
methylenechloride	-	N.F.	-	N.F.	13	1	2	
1,2-trans-dichloroethylene	-	N.F.	-	3	N.F.	N.F.	N.F.	

(A) Neutral-Base and Acid Fractions only Analyzed

(B) N.F. = Not Found

Figure 1

Effluent-Composite

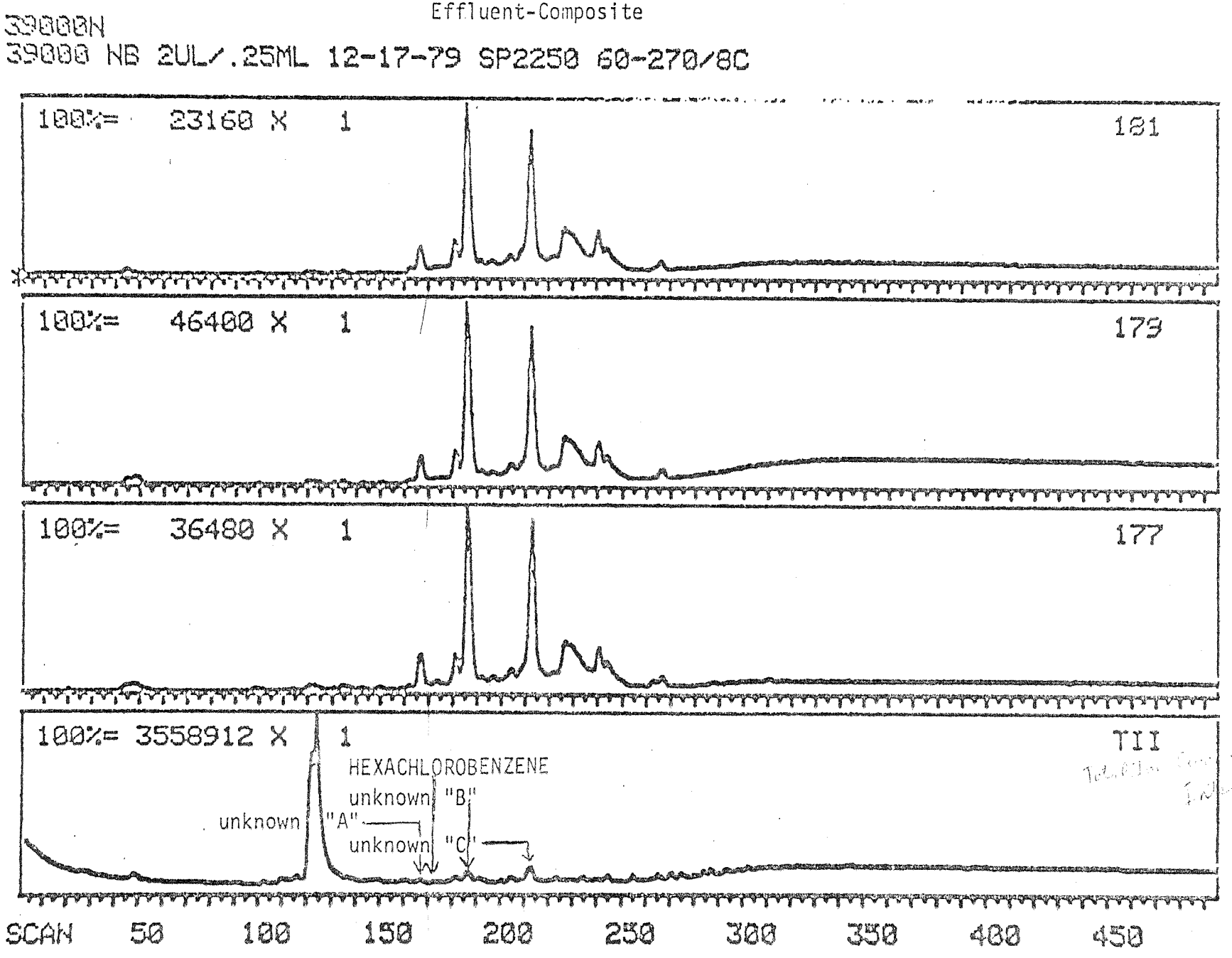


Figure 2

Influent-Composite

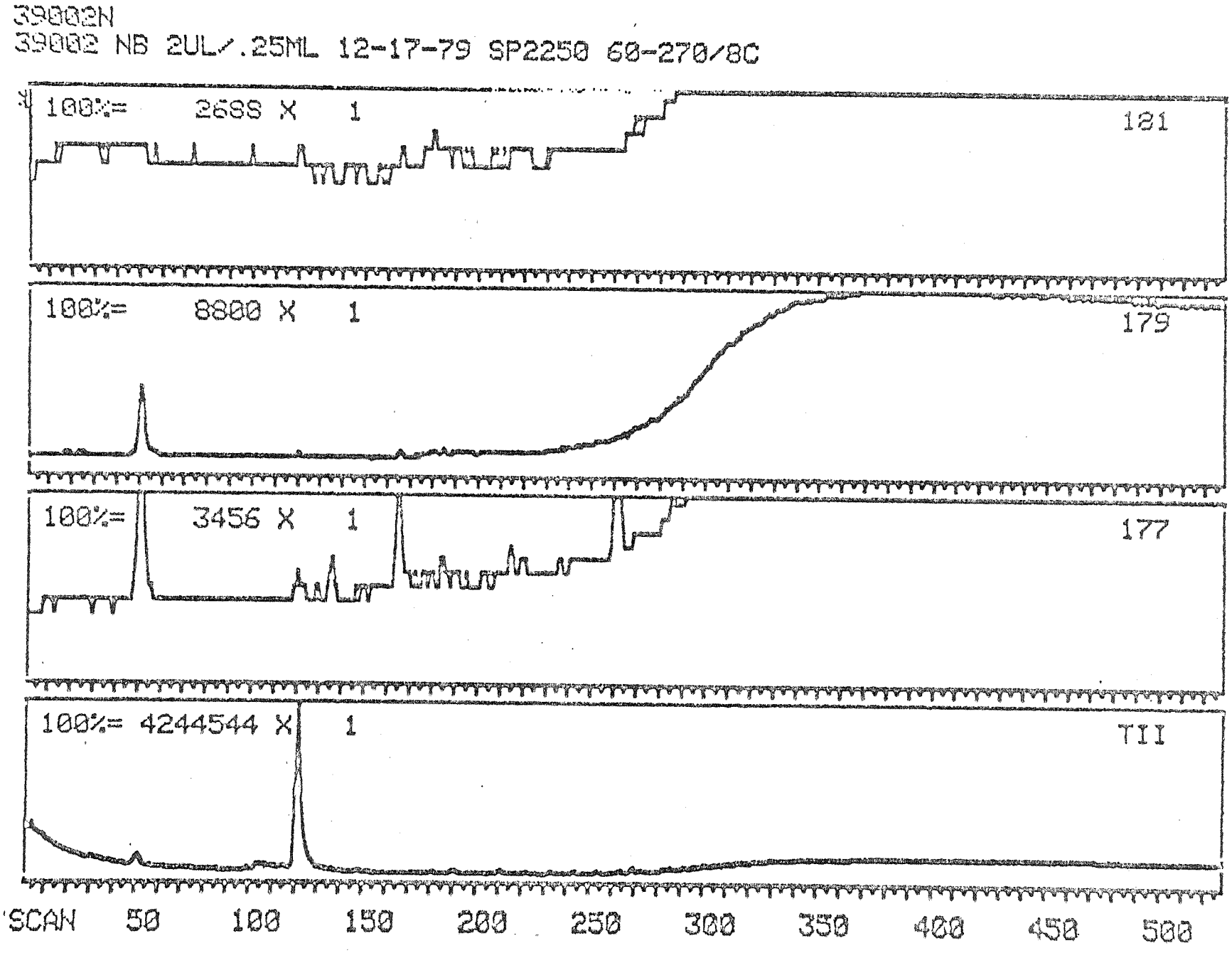


Figure 3

Stripper Effluent

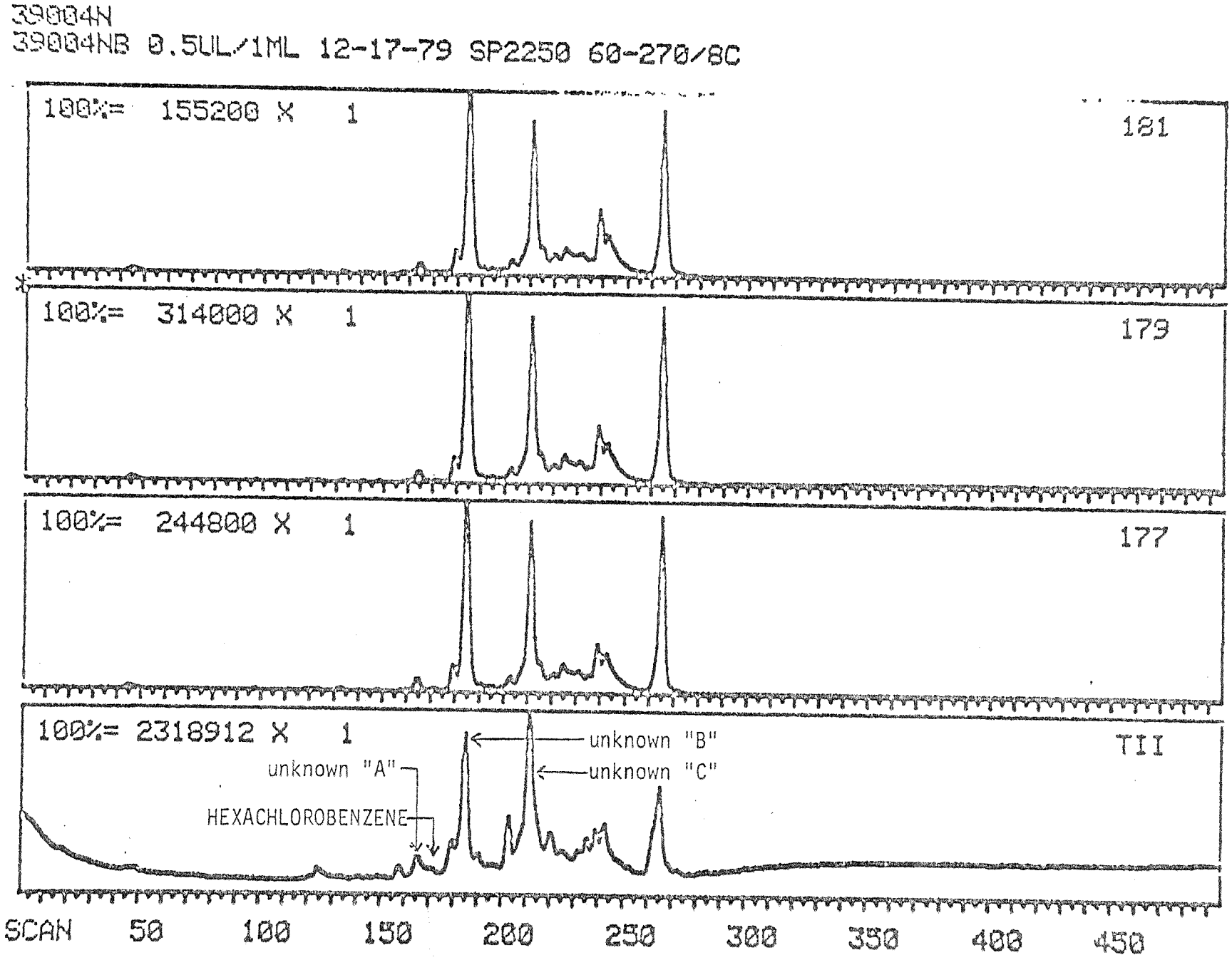
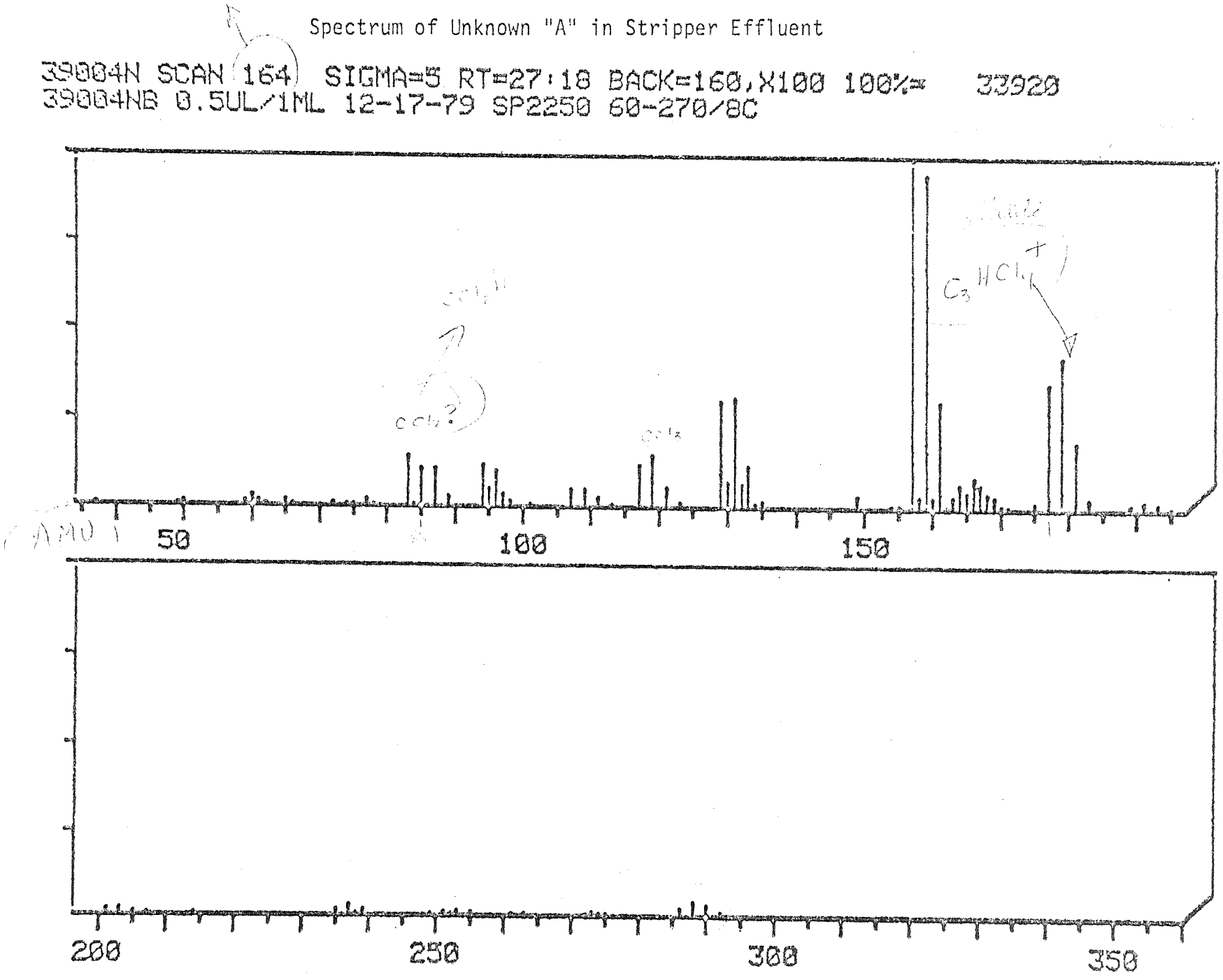


Figure 4

Spectrum of Unknown "A" in Stripper Effluent



Spectrum of Unknown "B" in Stripper Effluent

39004N SCAN 184 SIGMA=9 RT=30:20 BACK=180,X100 100%= 273600
39004NB 0.5UL/1ML 12-17-79 SP2250 60-270/8C

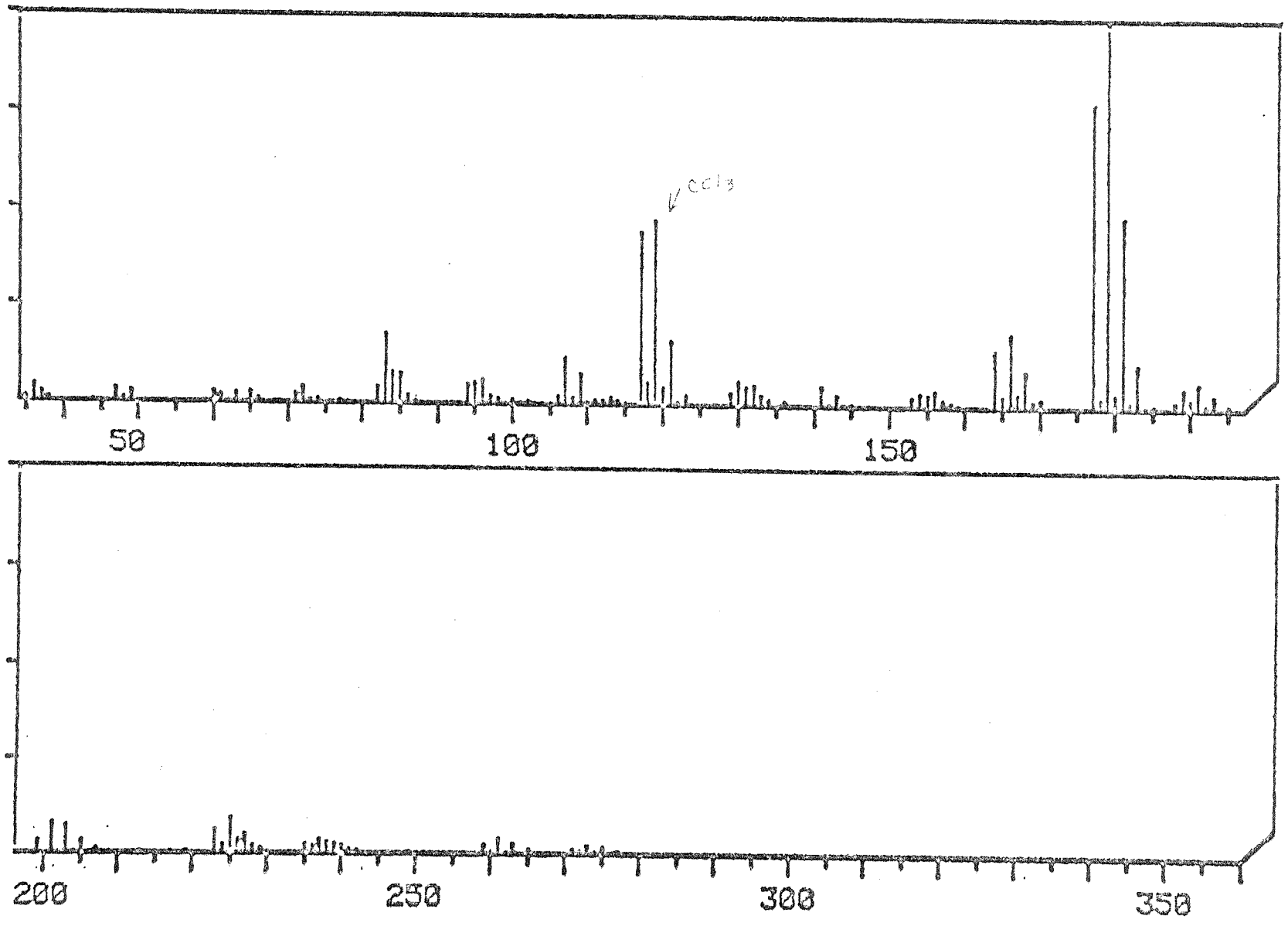
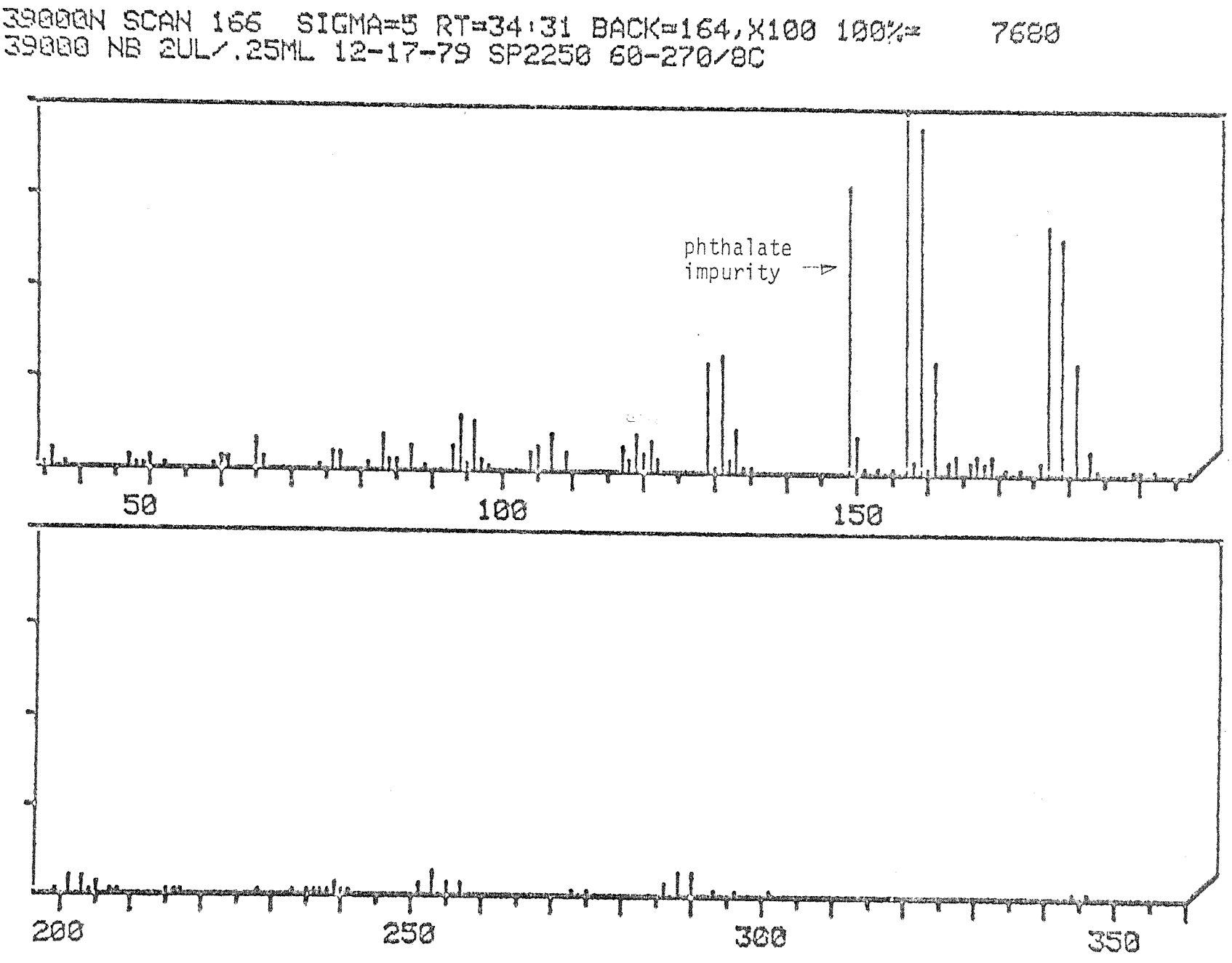


Figure 5

Spectrum of Unknown "A" in Effluent



Spectrum of Unknown "C" in Effluent

39000N SCAN 212 SIGMA=7 RT=41:30 BASE=179 BACK=209,X100 105%= 224-40
39000 NB 2UL/.25ML 12-17-79 SP2250 60-270/8C

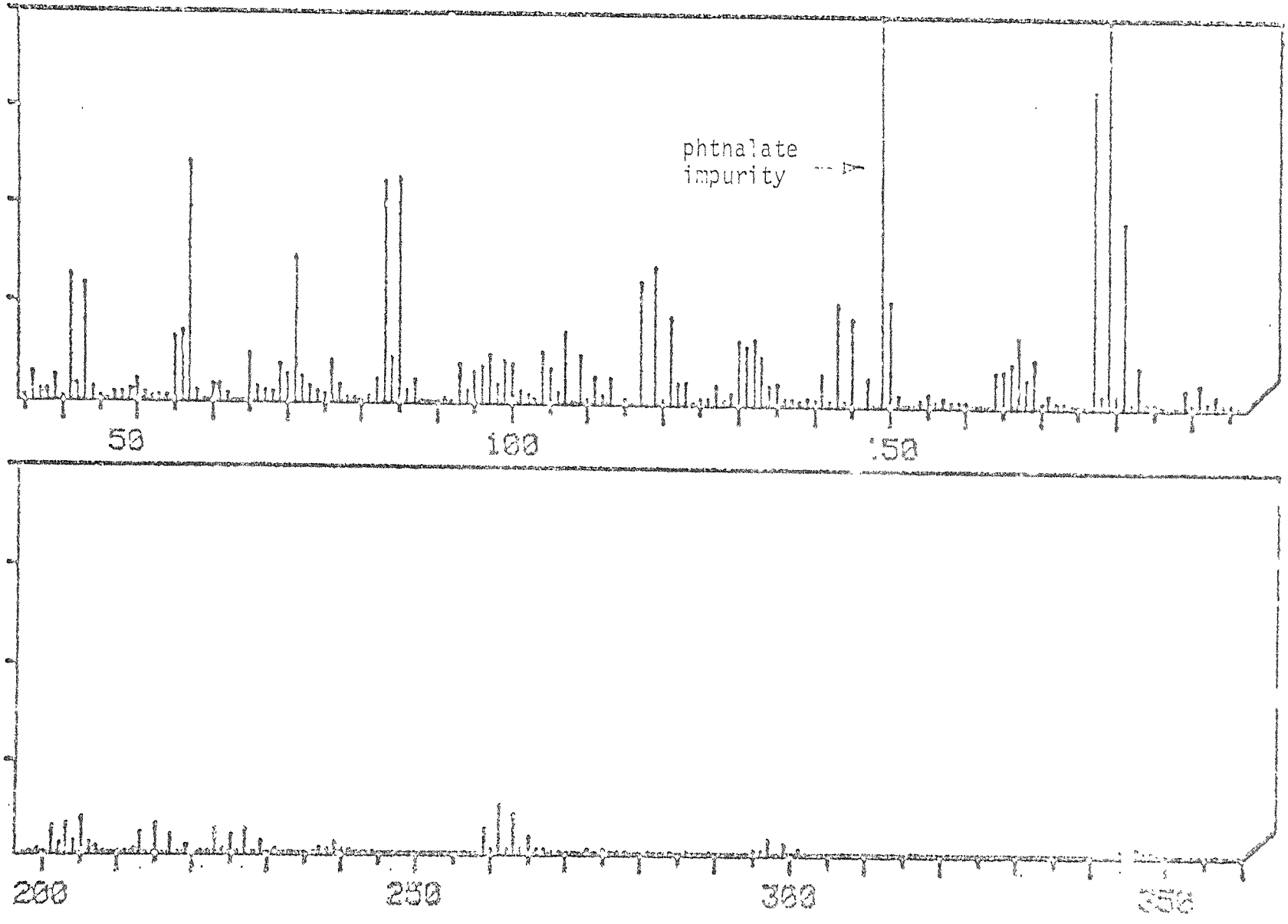


Figure 7

Spectrum of Unknown "B" in Effluent

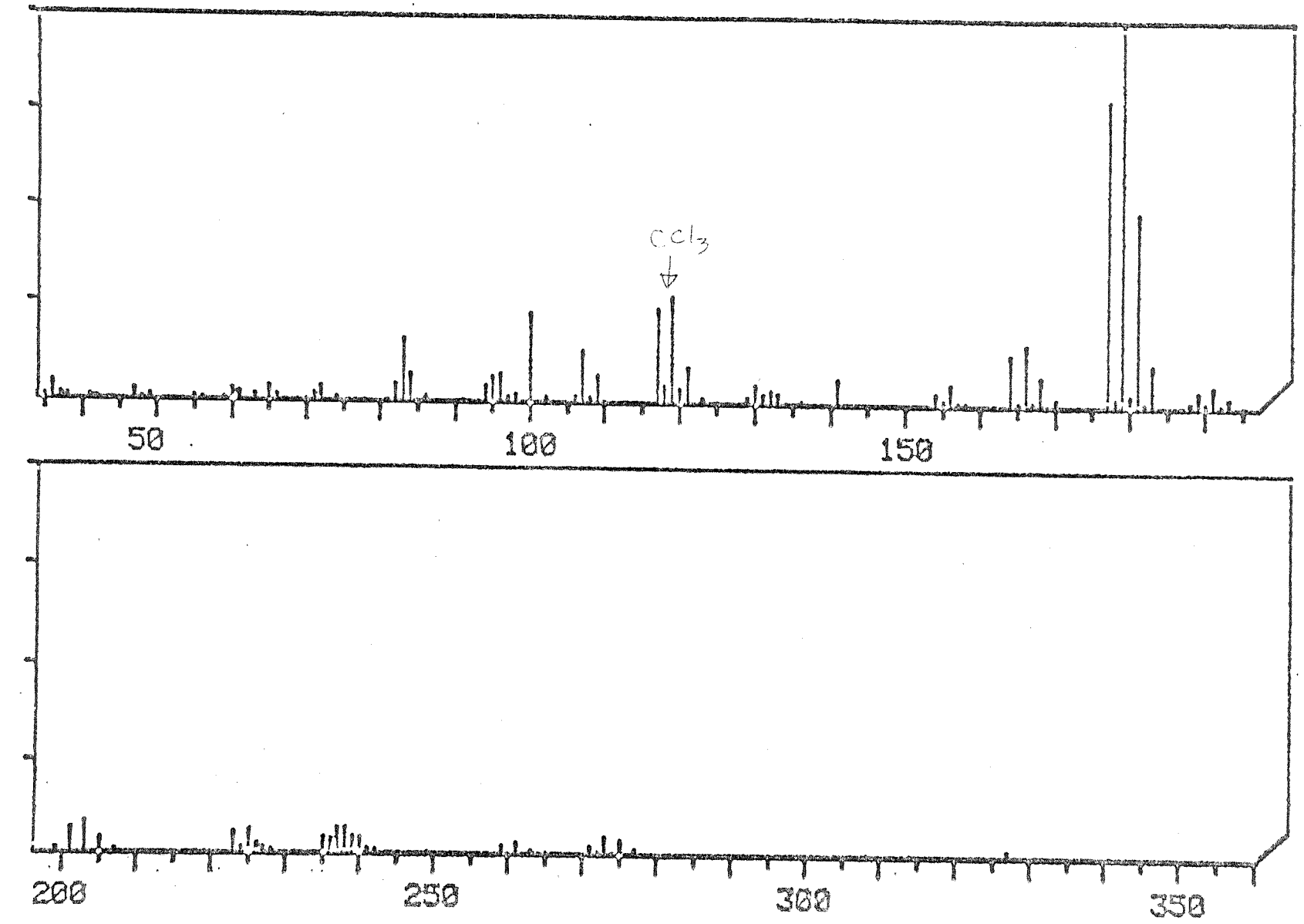


Figure 8

Spectrum of Unknown "C" in Stripper Effluent

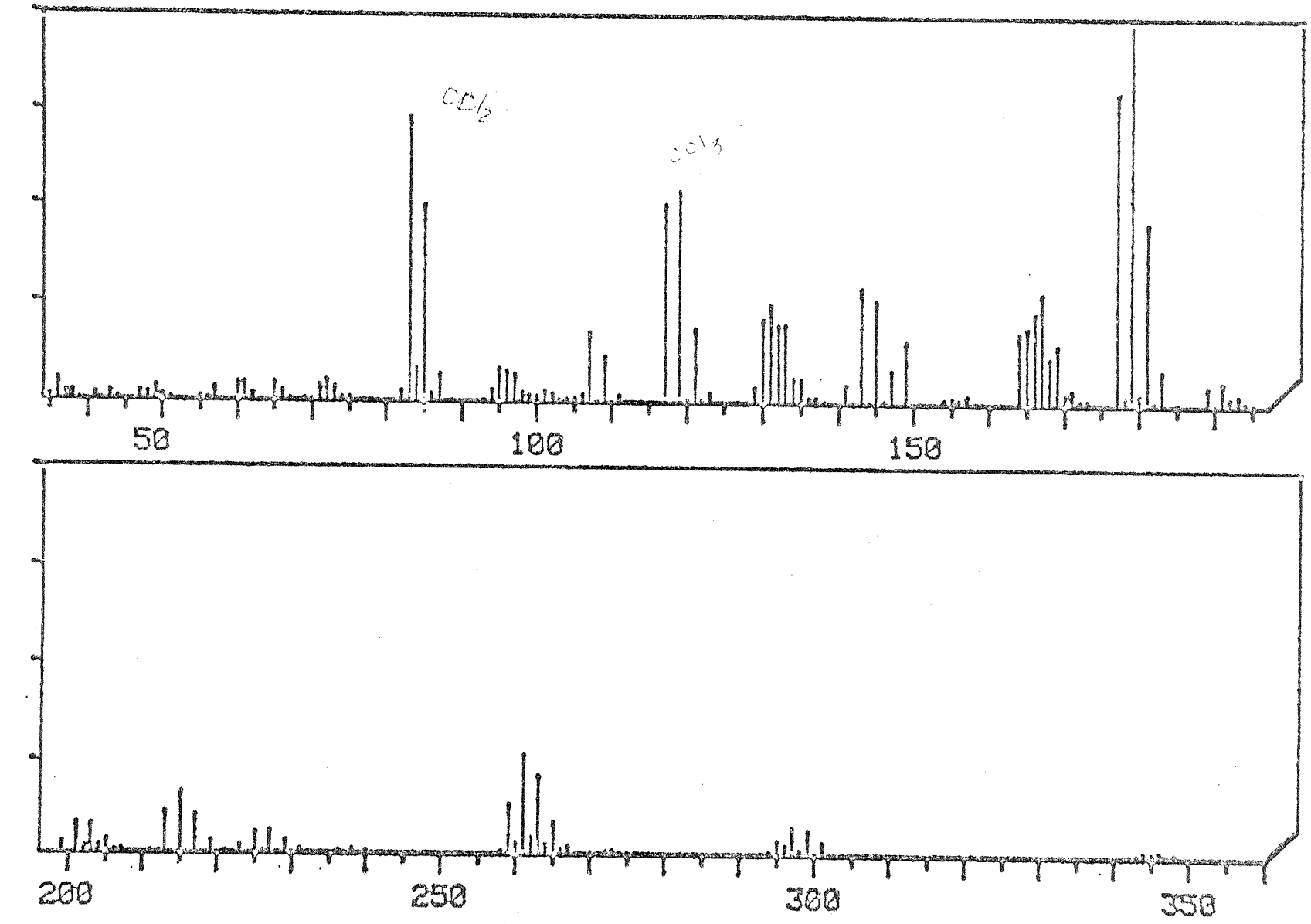


Figure 9

Spectrum of Unknown "C" in Effluent